On
Inflammation of Bone
and its immediate results
and an outline of the general
Treatment.

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Bone, minutely considered, is composed of an animal and an earthy part so completely and intimately combined, that when either is abstracted, by chemical or other means, there is no visible change of structure. The earthy constituent forms about two thirds of the weight of bone, and is composed of phosphate and carbonate of lime, with some fluoride of calcium, chloride of sodium and magnesium salts. The animal part is soft and flexible, and almost wholly convertible into gelatine, when boiled.

Bone presents two varieties of texture, viz: the compact, and cancellated. The compact forming the external wall; the cancellated, the internal cellular substance. These two forms merge into each other, and there is no abrupt line of demarcation between them. The cancellated tissue is composed of minute, spicula, and thin plates of bone, arranged in a cellular manner, so as to form a sort of cells, communicating freely with each other, and giving
Support to numerous vessels. Then a portion of the compact type of bone is broken across, numerous pores are seen running in the longitudinal direction of the bone. If these are examined with a microscope, the walls will be found to consist of concentric lamellae applied closely to each other. Some of these lamellae, however, do not form the walls of the canals, but are arranged concentrically to the medullary tube, and connect the tubes to each other. These canals are called "Haversian canals" after Dr. van't Hoff, an anatomist, who first noticed them. They transmit bloodvessels and their diameter varies from the root to the top of an inch. These canals are short, and are connected across the width of the bone, so as to form a communication between the internal and external surfaces. Between the layers of lamellae there are small irregular orifices, to which the name of lacuna is given.
And speaking from the lacuna, and entering into the topic of the lamellae-like spaces can be seen. These are called canaliculari. In the lacuna exist minute cellular bodies which probably have a part to perform in the accumulation of materials for the nutrition of bone.

The different forms of bones are divided into four groups. Viz.: The Long, the Flat, the Irregular, and the Short bones. The shafts of the Long bones, and the table of the Flat bones, are composed of Compact tissue. The Short bones, the articulating extremities of the Long bones, and part of the irregular bones are formed of cancellous tissue with an external layer of compact tissue.

The bones are all closely invested and lined by a coat of fibrous tissue, which seems to serve as a medium for the diffusion of the blood vessels before entering the minute apertures on their surfaces. Some writers apply a very important
Just to this membrane, and attribute the formation and reproduction of bone, almost solely to its agency. Others are of opinion that the power of forming of bone fibre into all together with the elements of the tissue itself. And, certainly knowing that the blood is almost as freely in bone, as in the soft parts, it seems very probable that its nutrition is carried on in the same way.

The nutrition and general organization of bone is very analogous to that of the soft parts, and, as would be expected, the diseases to which it is liable partake of much the same character, modified, of course, by the difference in structure.

Bone, then, is liable to atrophy, hypertrophy, and inflammation (which is, generally, the cause of the two former conditions) with its various results, suppuration, ulceration, ulcer and leucitis. The fact that the close and compact structure of bone lends the fluid, in some form of inflammation, may
intense, and in consequence, produces a shock effect upon the nervous system. The distance of bone from the surface, and the frequent difficulty in treating their diseases. And the great necessity for the perfect integrity of the skeleton, so as to enable individuals to perform the functions and duties of life with ease and comfort to themselves, all others in endeavoring a correct knowledge of the diseases of bone, and their treatment, a matter of the highest importance. Osteopathy frequently occurs in bone, and is the result of a certain grade of inflammation, or at least, increased vascular action, which may be brought on either by hereditary or accidental predisposition, or the occurrence of extraneous causes of irritation. Osteopathy occurs in persons who have been long affected with chronic chancrns, in young people of a scrofulous habit; where the constitution is tainted with syphilis; and where the use of Mercury has been carried to excess in its treatment; or where there is a complication
of the three last habits. In chronic inflammation it would seem to depend upon local congestion caused by the low degree of inflammatory action resistant in the part. So affinities occur in those parts which are most exposed, and consequently liable to mechanical injuries, and the cost effects of temperature. And when the constitution is labors under the poison of affinities, any slight cause will bring on local inflammation. Hypertrophy seldom occurs as the result of simple increased vascular action in healthy subjects. The general seat of hypertrophy, are the sheaths of the long bones and the flat bones of the cranium. The modes in which a bone may become hypertrophied are three: First by expansion of its tip toe, without much increase in the deposition of calcareous matter; the cells are enlarged, and the bone canals for the transmission of blood vessels are expanded; the surface of the bone becomes very porous, not from the existence of a greater number of apertures, but
From this expansion, it has in fact much the appearance which healthy bone presents under a strong magnifying power. Secondly, by enlargement of the bone, and great increase in the quantity of calcareous matter, this, however, is probably but the first from of a more advanced period. Thirdly, by osteosis.

The mode in which the first from proceed, as I have before mentioned, is the gradual enlargement of supplying the bone, and as a consequence of this the absorption, and expansion of the walls of the Recessus Canals. The process may go on for some time, and then, from some cause, probably the cessation of the cause of irritation, a different process begins, and gives rise to the second form of Osteosclerosis; oporous deposit takes place on the inside of the dilated Recessus Canals, and the result is great increase in the density and weight of the bone. This is in most cases to ossification of some
abnormal growth from the surface of a bone: some of these growths are fibrous, others have much the appearance of cartilage. Under the microscope the tissue of osteitis presents the same appearance as original bone, but loses very much in the degree of hardness they attain; some being cancellous in their structure, others having the hardness and compactness of ivory. This is another form of osteitis, which takes place at the insertion of tendons, at those strong aponeuroses are the attached to the surface of bone: this from depends upon ossification of the fibrous tissue, a preternatural development, caused by unusual exercise of the joint.

Bone may be enlarged in size in three ways, viz.: by deposition on its medullary surface, by expansion of its tissue, and by deposition on its external surface. This statement, however, does not, I think, carry with it its proper meaning. Perhaps the deposition of lymph on the surface of bone, does not consist of a
Continuous layer, as is held by some, but takes place in the minute interstices between the prolongations inwards of the periosteum to cover the small vessels. For if all these vessels were ruptured, as must take place, where there is a continuous layer of fluid between the periosteum and the bone, it would make a serious difference in the nutrition of bone.

Atrophy occurs from many causes; as for instance, long disuse of a limb from paralysis or disease; after wounds and bruises; in old age. It is also often seen in persons who have suffered from disease of some joint in early age, and when the joint had not been restored: it is then, more properly speaking, a want of development. In some cases diminution of the whole structure of the bone takes place, without change in its texture. In others the cells are enlarged, and the walls become thinner; the cells are filled with a reddish
brown serum, and a change takes place -
very analogous to that just before caries has
regularly set in, or the appearance presented
by the earlier stages of mottled opium.
Inflammation - Acute - occurs in bone as in
the soft parts, accompanied by its general
symptoms: pain, swelling, expansion &c.
The affected bone becomes red and deeply vascular.
so as to bleed as freely as any of the soft parts
when cut, and out of the contused part deeply
sensitive, granulations arise. The unyielding texture
of bone and its covering, coupled with the great
increase of sensibility, induces the pain in acute
inflammation very severe. The neural system
affected seriously: there are very marked signs followed
by a quick pulse, dry white tongue, and glacial
fever. In very urgent cases inflammation is
quickly followed by sepsis; extensive suppura-
tion takes place, and all the watery and
bodily consequences supervene, which result from the
presence of a foreign body with this aggravating
circumstance: that the injured cannot be
removed, until operation, which is a very tedious process, is complete.

Inflammation is more commonly with assuming a chronic form, the bones become enlarged and indurated, and in some instances are enlarged in length. As I have before mentioned, this form of inflammation occurs in constitutions labouring under some peculiarity of chronic, such as: chronic rheumatism, psoas, or suppurated. In cases where persons have suffered for many years from chronic rheumatic pains, all the parts have become so thickened and enlarged, that the great tautness in their eye and weight has proved a lasting source of misery and discomfort to the patient.

In chronic inflammation connected with syphilis, the shaft of the long bones, such as the tibia, which is more liable to disease of all kinds, than any other bone in the body, and the bones of the cranium are mostly affected. But these are often to be seen on the frontal and other bones, enlargement
Which are not really dependent upon disease of the bone itself, but upon inflammation of the periosteum. These enlargements are amenable to proper treatment, whereas the tissue of bone, when once fairly developed, is seldom or never reabsorbed.

Tuberculosis occurs in bone, as in the soft tissues. Its effects are first a low grade of inflammatory action, with tenderness, increased heat, and slight expansion of tissue. This condition may last for some considerable time, without any great change; and from this stage the bone may recover. The chief change is absorption of the fatty matter, and the deposition of tubercle. In this respect scrofulous disease of bone seems to differ from true Caries, in that disease, it is the animal matter which is absorbed.

Treatment of inflammation—When the inflammation is acute, the arrest of the disease is a matter of the greatest importance. For this purpose obvious general and local alleviation
must be immediately resorted to. Perfect rest, and a strictly antiphlogistic regimen should be enforced. And nothing given so as to produce its full effect upon the system, is a remedy of such well-known efficacy in these cases, that its exhibition is indispensable. But in cases of intense inflammation caused by violent alternations of temperature, or other causes, recovery comes so rapidly, that it has generally taken place, before the patient is brought under the notice of the surgeon. In these cases, of course, the treatment must be adapted to the existing state of the disease.

In chronic inflammation, the system will, almost always, be found suffering from some variety of specific disease; and the treatment must, in the first place, be directed to that.

The functions and secrections must all be attended to. The digestive function in particular.

In most cases of Typhula, the digestive function is greatly impaired, and defective.
Intuition, with greater liability to the occurrence of chronic diseases is always the result. The diet should be nutritious, easily digestible, but not stimulating. All exposure to sudden change of temperature should be carefully avoided. Change of air, and physical exercise, where possible, should be recommended. Tonics and stomachics might be occasionally given. But more particularly mild alteratives, and of these the lodiform potassic lead to have an almost specific effect in all inflammations of true and its diminishing incidence whether of recent date, or of some years' standing. The best dose for its exhibition is from three to four grains twice or three times a day, gradually increased, and discontinued at intervals. It has a more beneficial effect upon disease when given in this way than when its use is continued and the dose carried to any great extent. This is one indication of great importance in the treatment of all chronic diseases, which,
perfect regularity in meals and foods. In functional arrangements of the digestive organs, regularity in meals has a very marked effect. In long continued chronic inflammation of the ureters, gradual disorganisation is going on; counterirritation is of great service; and it must be modified according to the seat of the disease and the grade of inflammation present. Where, for instance, the diseased part is deeply seated and its role important, powerful counterirritants such as actual cautery, and the hot坊七 sha should be used, and placed immediately over the seat of the disease. But where the diseased bone is near the surface, great caution is necessary, for where the soft parts investing the bone are implicated in the inflammation, the application of counterirritants will only increase the mischief.

Suppuration in bone may be either acute or chronic; the acute form being diffuse,
and often accompanied by stiffness, and
chorea from. Circumscribed.
Circumscribed abscess generally results in
the cancellous tissue of the extremities of
long bones. The head of theibia is most
liable to it. But cases of true circumscribed
abscess have been met with in the shafts.
From some cause, most generally from tuber-
cular deposit, a small cavity containing
fluid is formed in the bone. This becomes
lined with a vascular membrane, and
the bone surrounding the cavity becomes
thickened and dense. Radiantly there are
no peculiar diagnostic signs, and it may
be often difficult to distinguish it clinically,
or from inflammation. There are tenderness
and slight thickening over the point. But
the principal point on which a correct
diagnosis can be based, is the constant
aching pain referred to the particular spot.
In this, like other affections of the bones,
affections of inflammation occur, and give
Due to severe constitutional irritation.
The treatment is, when symptoms decidedly indicate the existence of an abscess, to lay bare the bone, and perforate its walls to allow of the escape of the contained matter. In most cases immediate relief is the result, and the aperture closes without further trouble. As the abscess is generally small and it may be difficult to perforate directly upon it, if the abscess be not all once found, it will be advisable to precoce the cancellous tissue in the neighbourhood of the aperture, so as to induce the escape of the fluid.
Diffused suppuration takes place in the flat bones of the cranium, and in the shafts of long bones, and it may involve the whole of the investing membranes. It commences in the internal periosteum or medullary membrane, and is caused by exposure to wet and cold, or by some serious constitutional affection, such as fever or smallpox. It also sometimes comes on after operations. When
Suppuration has attached to the medullary membrane of a long bone; pus is expelled throughout the whole medullary canal, and sometimes of the articular assistance are involved, but how far is fortunately of rare occurrence. The periosteum is secondarily affected; it becomes very vascular, and is readily separable from the bone for its whole length. And in process of time pus is poured out between it and the bone. The frequent accompaniment of diffused suppuration is rare and it may be often difficult to tell whether the suppuration is the result or the cause of sepsis. But when purulent matter is found in the medullary tube, it must be taken as a proof that suppuration has taken place before the occurrence of the sepsis, because pus will not be present in the medullary tube (in cases where the whole shaft is decorticated) but as the result of suppuration there. In some rare cases ulceration takes place through the wall of the bone and the matter is
The treatment is to make free openings for the escape of the matter. In case where sequestron has taken place, there may be a chance of extracting the sequestrum bone, and the formation of a necrotic case; the system should be supported and every assistance afforded. But where the suppuration is excessive,
and the system exhausted, manipulation, when possible, must be had recourse to.
Suspension sometimes rests on the diploe of the skull, and it has been recommended to perforate the outer table to allow of the escape of the fluid. But on account of the great difficulty of diagnosing whether the fluid is between the dura mater and the skull, or between the tables of the skull, and even were that known, the great risk of fatal inflammation of the membranes of the brain after the operation, some surgeons doubt the propriety of its adoption.

Caris—This term had been applied to all varieties of eruption in bone; but by it, I would mean that peculiar morbid action which occurs in the cancellous tissue, and sometimes in the shafts of the bones of unhealthy subjects. A slow organic change goes on: the bone becomes at first more vascular; the cells then become filled with a thin reddish-brown serum, i.e.
which some oil globules are generally seen floating. Absorption of the normal part of the bone is the next stage, and it becomes fragile and gritty. The cell walls become thinner, and the cells enlarged. And finally an intractable form of ulceration is established. The lacuna contain minute cellular bodies which, in Mr. Goodall's opinion, perform an important part in the nutrition of bone. The relation of these cavities, in canes, and the consequent determination of their contents, would fully account for the compactness of the minute spindle of bone, which are discharged from a cancerous ulcer, and also for the intractable nature of the disease. A cancerous bone has a peculiar worm eaten crumbling appearance which is very characteristic. Cance is generally met with in the irregular and short bones, as the bones of the spinal column, and the bones of the carpus and tarsus, but it has also been known to involve the
Whole of the shaft of a long bone.

When caries comes on, a lesion of uncertainty, hardly amounting to pulsation, is the first indication of mischief, and the soft parts are but little affected. After some time, and abcess forms and bursts in the neighborhood, which defies all efforts to heal it. This contracts into a tumor from which a thin and sometimes fetid discharge issue; mixed with this is the gritty debris of the crumbling bone. The external surface of the tumors have a peculiar appearance, fungous granulations protrude and form papilla; these are also found in necrosis, and it is sometimes difficult to diagnose which disease is present. This is the general history of a case of caries as it occurs in those bones which are near the surface. But in the deepseated bones as the bones of the spinal column, caries may attack and destroy large portions of the cancellous typeue, without...
Any inflammation, and without much pain to the patient; in this way the bodies of two or three vertebrae may be almost wholly destroyed.

Treatment—As in chronic inflammation, the system is generally weak, and the various functions imperfectly performed. There will also most probably be a tendency to tubercular deposit. The treatment should therefore be the same as that recommended for chronic inflammation. The local treatment should be nothing to us to promote any tendency there may be to spontaneous recovery. But where the constitution is much affected by the drain of the sinuses, careful motion must be practised. Careful in two subjects; firstly, careful to excise all the affected parts; secondly, careful to space as much as possible of the soft parts, because cancer often occurs where the quantity of integument is of great importance.
When cancer occurs in the central parts of the stomach, it is difficult to determine the exact extent of the disease. In these cases and where the integuments are much affected it will be advisable to amputate.

Ulcera-tion occurs in these cases, and, as happens in the soft parts, each ulcer varies in character as the cause different. Ulceration may be simple or specific. The simple ulcers occur where there is no cancer in the constitution, and is mostly the result of injury. It has many characters in common to the simple ulceration of the soft parts, and one particularly is the tendency to thickening in its neighborhood, and the deposit of new opaque tissue around it, which sometimes attains considerable size: a character which is not present with any other kind of ulcers. The specific ulcers depending upon a glandular tissue attacks a large surface at different
points, and may invade the whole of a
mucous, giving it an eroded appearance.
This form of ulcer is now disappearing, it
was brought on by the indiscriminate use
of Mercur. in the treatment of Syphilis.
Treatment—the simple inflammatory ulcers
is to be treated like all other inflammatory
affections: when there is inflammation
present, bleeding and afebrileptic, if
it gets indolent, good diet and change of
air. The local treatment must vary accordly.
The local treatment of the syphilitic ulcer
should be soothing and unstimulating,
and all the efforts of the surgeon must
be directed to the constitutional affection.
When ulceration is known to have taken
place in any of the deep seated joints, the
establishment of powerful counterirritation
has a very marked effect in relieving pain,
and sometimes in arresting the ulcerative
process. For that purpose it should be actively
kept up, because if it is allowed to flag,
The pain in the joint returns, and the patient suffers from a double evil: the existence of an artificial ulcer externally, and internally the irritation of the original disease.

Necrosis, as the term implies, is the death of a portion or the whole of a bone, and is analogous to gangrene of the skin. From some cause or other the supply of blood to the affected part is stopped; all communication with the surrounding tissues is cut off, and in a few days of time the dead bone is completely separated, and becomes loose. Necrotic bone when deeply seated is white, then natural, but when it is exposed to the effects of the atmosphere, or has been long at the bottom of a foul ulcer, it assumes a brown and sometimes a black colour, which is, however, only superficial. Necrosis may be caused by mechanical injuries, and by exposure to great alterations of
Temperature; or it may owe its origin to Typhus Fever, Typhula, Typhilitis, Rheumatism, and most especially to the effects of Mercury. It has also been caused by the application of powerful escharotics to an ulcer on the skin. Necrosis may come on in two ways: first, suddenly, as the result of severe and destructive inflammation; secondly, it may take place upon some gradual organic change which has been going on in the bone; the character of the sequestrum will of course differ in the two cases. The seat of necrosis is generally the compact tissue. The shafts of the long bones and the flat bones are the most liable to it. But it also occurs in cancellous tissue, affecting, in some cases, the whole articulating extremity of a long bone; in others but a small portion of the internal cancellous matter. Both the last forms produce serious and often dangerous effects; they are, however,
Fortunately comparatively uncommon. When it occurs in the spine or in the extremities of the fingers and toes, it is more local in its effects. The congestion which accompanies it probably accounts for the congestion which occurs in other parts of the body during this disease. Influenza and typhus are known for producing causes of the establishment of abscesses, and injuries which, in ordinary cases, would cause little or no inflammation, both in constitutions affected by either of these taints, cause extensive abscesses. The bones which are most frequently attacked are the tibia, femur, tarsal bones, clavicle, radius, and ulna; the bones of the cranium are also liable to be affected by it.

The extent of bone affected varies. In some instances the outer lamella may die, while in others the inner suffer alone. When but a small portion of the outer lamella dies, it will be difficult, it will be difficult.
to distinguish it from a common suppuration abscess, that it is arises in consequence of external injury, and the surrounding parts are not much inflamed; in such a case the constitutional symptoms will not be very urgent. Lethargic children are liable to a form of septicis which attacks the bones of the wrist and ankles. An indolent swelling is the first symptom, without much pain, a thin fluid collects which ultimately finds its way to the surface, and when a probe is introduced into the opening the dead portion of bone may be poked out at the bottom of it. When septicis occurs in those persons who are constitutionally predisposed to extensive disease of the internal system, or when it is produced by Typhus Fever, the symptoms are characteristic. They are more accelerated pain in the limb followed by extensive swelling, which has no well defined border or termination, and has a firm unyielding
fell. Abscesses form and burst, and contract into fistulae which have the characteristic sanguinous orifice of Cloaca, and the integuments have a franky exudation from aspect like that which occurs where there has been diffuse suppuration in the acetabule. Suppurative suppuration of a bone may take place in consequence of acute pustulitis, and the whole of a small bone will sometimes be destroyed; the distal phalanges of fingers and toes are sometimes lost in this way.

There is a peculiar form of arterial affecting the guns of persons employed in the manufacture of matches, in which there is a peculiar deposit on the surface of the affected bones; it was first noticed by the German physicians, but has since been seen in England. This is said to be caused by the destructive effects of the phosphoric acid which is generated in the manufacture of these articles.
Treatment — In the first stages of sepsis, when the focus is visible, and the inflammatory process tends to be extensive, every effort should be used to check the inflammatory action, and prevent the appearance of suppuration. Local dejection should be freely and repeatedly used. Perforate a strictly antiphlogistic regimen, such as and antimonial medicines, and the local application of lotions and warm poultices. If suppuration has come on, which will probably be indicated by showers, the pus must be freely discharged, and the ulcerous so placed as to prevent any accumulation of pus. When necrosis is fully established and the dead portion separated, the removal of the affected part is, of course, the great indication; but the circumstances under which this is to be attempted, are another consideration. In cases of slight superficial suppuration, some means advise the application of escharotics, to
 Expedite the process of separation, unless doubt its propriety. The thing is certain that, when the necrosed bone is quite separated, and where its removal is practicable, it ought to be attempted. But where the presence of the necrosed bone is attended by more constitutional irritation, and where a special operation for its removal would only cause more serious inflammation, as, for instance, in cases of necrosis of the cancellous texture in the head of the tibia, amputation must be resorted to. In cases where an operation is unpracticable, symptoms must be combated as they arise, and every effort made to give care and comfort to the patient.